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ABSTRACT

This report describes the health status of children and adults in developed and developing countries. Worldwide, life expectancy at birth rose from 47 to 67 years between the 1950s and late 1980s. However, more than 300 million people live in countries where life expectancy is below 50 years of age and 1 of every 10 newborns dies before age 1. In developing countries, UNICEF has led an effort to improve child survival through education, inoculation campaigns, anti-malaria and nutrition programs, and programs that promote oral rehydration therapy and breastfeeding. However, malnutrition has limited the gains in child health. Improved adult health in developed countries reflects lifestyle changes and improved medical technology. In developing countries, unsanitary conditions and the effects of childhood illnesses may perpetuate adult health problems. Urbanization brings new health hazards, and AIDS threatens further health gains, especially in sub-Saharan Africa where 10 million children may be orphaned by the disease by the year 2000. Achieving the goal of good health at low cost, as China and Sri Lanka have, requires strong political and social commitment, especially to improving women's education and ensuring equal access to health care. Lists of 71 references and 32 suggested readings are provided. (Author/BC)

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The Challenge of World Health

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Abstract—Worldwide, average life expectancy at birth rose from 47 to 67 years between the 1950s and late 1980s. But these improvements were unequally shared. Over 300 million people live in countries where life expectancy is below 50 years and one of every 10 newborns dies before age one. Reducing these gross disparities, within as well as among countries, is the health challenge of the 1990s. And the priorities are very different in developing and developed countries.

UNICEF has led a worldwide effort to improve child survival through education, inoculation campaigns, and nutrition and anti-malaria programs. The percentage of children vaccinated against major diseases soared to nearly 80 percent in 1989, from about 15 percent in 1980. Yet malnutrition—a contributing factor in up to 10 percent of child deaths—has limited the gains in child health.

Improved adult health in developed countries reflects lifestyle changes—less smoking and obesity, more exercise—as well as medical technology. But it is not clear whether the elderly are living healthier as well as longer lives.

In developing countries, unsanitary conditions and the effects of childhood illnesses may perpetuate major adult health problems, such as tuberculosis, liver cancer, and maternal mortality. Urbanization sometimes brings more accidental deaths and new health hazards. Recently, AIDS threatens further health gains—especially in sub-Saharan Africa where 10 million children may be orphaned by the disease by 2000.

To bring health to all—or at least, most—of the world, nations and international groups face a daunting, but not impossible task. Good health can be achieved at low cost—as China and Sri Lanka have shown—but it requires strong political and social commitment, especially to improve women's education and ensure equal access to health care.

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The Challenge of World Health

by W. Henry Mosley and Peter Cowley

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The 20th century has seen unprecedented gains in human health and survival. On a global scale, the average life expectancy for a newborn baby doubled from about 30 years in 1900 to 64 years in the late 1980s. For a country like China, this has meant advancing from conditions at the turn of the century, when scarcely 60 percent of newborns reached their fifth birthday, to the present, when more than 60 percent can expect to pass their 70th year.

Advances in science and technology in the 20th century, particularly since World War II, have reached the point where entire populations can approach what appears to be an upper limit in average life expectancy. In Japan, where life expectancy is 79 years, a newborn has only a 4 in 1,000 risk of dying before its first birthday and less than a 1 in 1,000 risk of dying at any age between 1 and 40.

Tragically, social development around the world has not kept pace with advances in the biomedical sciences. More than 300 million people live in two dozen nations where average life expectancy is less than 50 years; in these countries over 100 of every 1,000 newborns die before age one.[1] Reducing these gross disparities in life expectancy—which can occur within prosperous countries as well as across countries—is the health challenge of the 1990s. The constraints to achieving this goal are fundamentally social and political. The scientific base is largely in place and ample evidence from around the world suggests that a great deal of good health can be provided at low cost. China and Sri Lanka are good illustrations: Each has achieved a life expectancy of 70 years with an annual per capita income of less than US$450.

The health picture in the world today reflects the dynamics of political, economic, social, and population change in recent decades. Health in the future will be determined by the choices governments make. Vast improvements in human welfare are possible, but if disparities are allowed to persist, a large fraction of the world's population may never enjoy the level of health already within reach.

Population Dynamics and Health

To assess a population's health situation, mortality levels must be examined within the context of the population's age structure—the proportion of the population in each age group (see Table 1). Under the high-mortality conditions typical of many less developed countries, populations usually have high birth rates and a young age structure (a high proportion of children, adolescents and youth, and a low median age). In these settings, about half of all deaths occur to children under age five, largely caused

by infectious diseases, while fewer than 5 percent of deaths are among the elderly over age 75. In contrast, in the low-fertility, low-mortality developed countries with an older age structure, fewer than 2 percent of deaths are among children under age five, and almost two-thirds are among the elderly over age 75.

These contrasting health patterns have many consequences. In high-mortality African villages, for example, deaths among infants and young children occur 10 times more frequently than among the aged. In these circumstances, societies may deal with the frequent deaths of their children by placing a high cultural value on large families, forming only loose emotional attachments to children, and showing great veneration for the elderly. Parents may postpone naming newborns for several months until survival is more certain, and a mother may fail to recall all the deaths of her offspring when asked in surveys. At the same time, families may make substantial investments in funeral arrangements for the few relatives who die at an advanced age.

In the low-fertility, low-mortality settings typical of most industrialized countries, infant and child deaths are so rare relative to adult deaths that they have become socially unacceptable. A family's grief for the loss of an infant may far exceed that for an aged relative. Since child survival is the norm, parents tend to invest much more in each child emotionally as well as financially, and the desire for large families declines.

The demands on the health system will differ under these two circumstances. In industrialized countries, death is often the terminal event after a long series of increasingly debilitating chronic diseases. Providing extended periods of sickness care for an increasingly disabled aging population drives the medical system. In developing countries, maternity and infant care, particularly treatment for infectious and parasitic diseases, is in demand. Since infections respond rapidly to treatment, the need for long-term hospitalization is limited. It must be recognized, however, that the largest age group in these populations is adults ages 15 to 64 (see Table 1) and that in most developing countries this group, particularly the men, may consume the bulk of the limited medical care available in hospitals and health centers.

The demographic transition—the historical shift of birth and death rates from high to low levels—also has profound implications for a country's health system. In the Third World, mortality declines usually have preceded the decline in fertility, as advances in the

Table 1

Population in Developed and Developing Countries, 1960-2020

Age group	Population in millions			Percent distribution			Percent growth	
	1960	1990	2020	1960	1990	2020	1960-1990	1990-2020
Developed countries								
0-14	270	258	244	29	21	18	-4	-5
15-64	595	803	864	63	67	64	+35	+8
65+	80	146	234	8	12	18	+83	+60
Total	945	1,207	1,342	100	100	100	+28	+11
Less developed countries								
0-14	847	1,454	1,836	41	36	27	+72	+26
15-64	1,149	2,447	4,441	55	60	66	+113	+81
65+	79	184	472	4	4	7	+133	+157
Total	2,075	4,085	6,749	100	100	100	+97	+65

Source: United Nations, *World Population Prospects 1990* (New York: UN, 1991).

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treatment of infectious diseases improve infant survival. Initially, the population increases rapidly as growing numbers of infants survive. Later, as birth rates begin to fall, the growth of the population in the youngest ages slows. But because of the large group of young people already born, there is built-in momentum for continued growth of the adult and elderly population for many decades to come.

In less developed countries, the fastest growth will be among the elderly who will put rapidly increasing demands on a health system barely meeting current needs.

In the future, the demographic transition coupled with projected declines in mortality will dramatically influence the world's health picture.[2] As depicted in Table 1, most of the population growth in developed countries during the next 30 years, both absolute and relative, will be in the oldest age group, which already consumes substantial health-care resources. In less developed countries, the fastest growth also will be among the elderly who will put rapidly increasing demands on a health system barely meeting current needs.[3] To some degree, the slower growth of the population of children and the substantial gains projected in child health may compensate for the elderly's new demands on health services. But this will be more than counterbalanced by the large increase in the numbers of working-age adults requiring more health services.

Health risks are also changing at an unprecedented rate as the world becomes more urbanized. Urban life is already well established in the developed world. Sixty-one percent of developed-country residents lived in urban areas in 1950. This grew to 73 percent by 1990 and is projected to reach 78 percent by 2020. For less developed countries the shift is even more dramatic. Only 19 percent of the Third World population lived in urban areas in 1950. This had almost doubled to 34 percent by 1990 and is projected to reach 54 percent by the year 2020.[4]

With better living conditions, transportation, and markets, some segments of the urban population enjoy better nutrition and declines in the incidence of the infectious diseases of childhood. At the same time, however, urban residents face new health risks including motor vehicle accidents, pollution, increased consumption of tobacco and alcohol, overnutrition, a sedentary lifestyle,[5] and a greater risk of contracting sexually transmitted diseases.

Economic growth is often associated with increasing inequality.[6] The impoverished—a majority in some countries—live mostly in rural villages or urban slums. They often are subject to the health risks of both the underdeveloped and modernizing sectors of society. They live under conditions conducive to the spread of infectious diseases and have the poorest diets. At the same time, they are more subject than wealthier groups to accidents and injuries and often are the targets of commercial advertising encouraging unhealthy behavior such as cigarette smoking.

Indicators of Health Status

The World Health Organization defines health in positive terms as "a state of complete mental, physical, and social well-being." While this concept may appear straightforward, it does not easily lend itself to measurement. Consequently, to describe the levels, trends, and differences in health, demographers measure the deviations from the healthy state as indicated by the levels of mortality (death) and morbidity (disease and disability). Because mortality is an unequivocal indicator of a population's health status, demographers give considerable attention to analyzing patterns of mortality change and developing standard measurement techniques. Death rates are adjusted for differences in age structure, for example, to obtain a more accurate measure of mortality change over time or to compare rates from a very young country, such as Mexico, with an older country such as Denmark. National mortality data are available for every country in the world; it is important, however, to appreciate the limitations of these data, which are severe in countries with the highest level of mortality (see Box 1).

Box 1

Sources and Limitations of Mortality Data

The ideal sources of data on mortality are national vital registration systems in which deaths are recorded by age, sex, and cause, along with other information. Essentially all of the world's industrialized countries are covered by vital registration systems, but in the developing world, these systems are far less complete. Only an estimated 68 percent of deaths are recorded in Latin America, 15 percent in Asia, and less than 1 percent in Africa.[1]

In fact, vital registration systems in Asia are somewhat better than implied by these figures. China and India, which together constitute the bulk of the Asian population, systematically collect death statistics from representative samples of their populations. Since 1964, India has had a national sample registration system to enumerate births and deaths, and more recently, a rural cause-of-death survey based on lay reporting of the cause of death. A sample of these deaths is verified by physicians. China has a national sample registration system that provides mortality data, most of which is medically certified for more than 100 million people.[2]

In the last 15 years, substantial progress has been made in obtaining reliable estimates of infant and child mortality and fertility from many developing countries from the World Fertility Survey Program and its successor, the Demographic and Health Survey (DHS) project. These surveys obtained a detailed birth and child-death history from a national sample of women of reproductive age. Since 1980, the DHS program has covered approximately 30 countries in Africa, Asia and Latin America, and has provided high-quality information on recent trends and factors influencing infant and child mortality.

In countries without vital registration systems, mortality estimates may be derived from information from censuses and surveys. But the accuracy varies widely depending on the survey design, the questions asked, and who asks and who responds to the questions. Demographers have developed analytical techniques to estimate levels and trends of mortality from census and survey data.

Because censuses and surveys are infrequent, there are many gaps in the knowledge about mortality in the developing world. Nevertheless, international agencies such as the UN Population Division and the World Bank publish current estimates of the population and vital rates for nearly every country in the world.[3] This is done by using all information available, making assumptions about the rates of change in a country's fertility and mortality, and using published model life tables. These estimates and projections are revised as new information becomes available. Because the estimates rest on assumptions based on incomplete data and statistical models, it is no surprise that the UN and World Bank may publish different estimates of the population size and vital rates for the same country.

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Mortality measures by no means give a full or adequate picture of a population's health. Equally important are indicators of morbidity, measured by the incidence or prevalence of specific diseases and disabilities. In the past, when most countries experienced high mortality and illnesses rapidly progressed to death, cause-specific mortality rates provided a good picture of a population's health. Presently in low-mortality industrialized countries, medical interventions postpone deaths. As more people are kept alive with sophisticated treatments, the prevalence of chronic diseases and disabilities in surviving populations will increase. Failure to take this trend into account gives an incomplete picture of health conditions. This is particularly important in developed countries where the greatest future health gains will come from reducing the incidence or delaying the onset of chronic diseases rather than extending life expectancy.[7]

National sample surveys are necessary to measure the prevalence of chronic health conditions (for example, diabetes), precursors to ill health (for example, high blood pressure), health-related behaviors (for example, smoking), disabilities, health-care practices, and health expenditures. Even less information is available on levels, trends, and patterns of morbidity and disability around the world because such data are obtained infrequently and there are problems in developing standard, internationally comparable measures.[8]

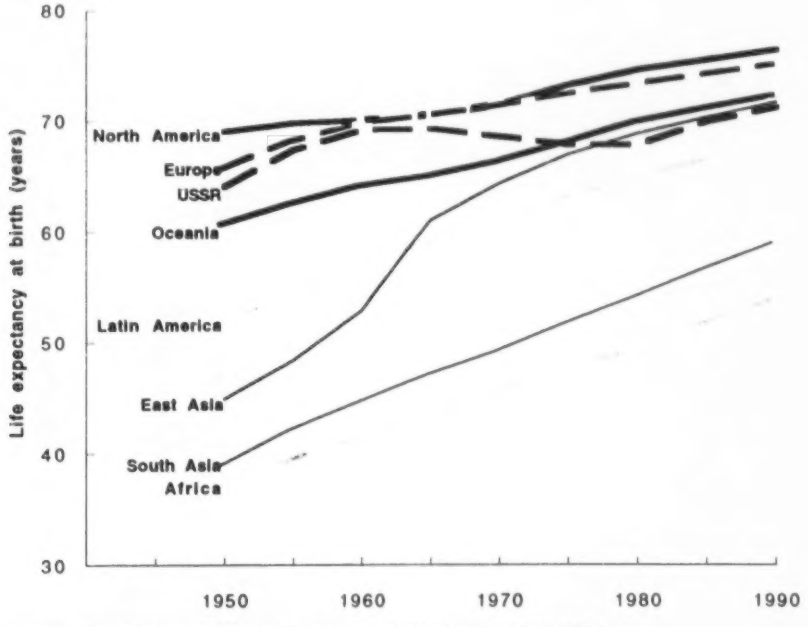
Gains in Life Expectancy

World life expectancy rose from 47.5 years to 63.9 years from the early 1950s to the late 1980s.

In the past four decades, the world's population has experienced a remarkable gain in life expectancy. The United Nations estimates that world life expectancy rose from 47.5 years to 63.9 years from the early 1950s to the late 1980s. This represents an addition of almost one-half year to life expectancy in each year over that 35-year period.

While every region of the world experienced an improvement in survival, the gains were not shared equally, as shown in Figure 1. In the

Figure 1
Life Expectancy in Major World Regions, 1950-1990



Source: United Nations, *World Population Prospects 1990* (New York: UN, 1991).

early 1950s there was a wide gap between the life expectancies of the more developed nations and the developing nations of Asia, Africa, and Latin America. Over the next 35 years, this gap diminished, but mortality decline followed distinct patterns in many of these regions.

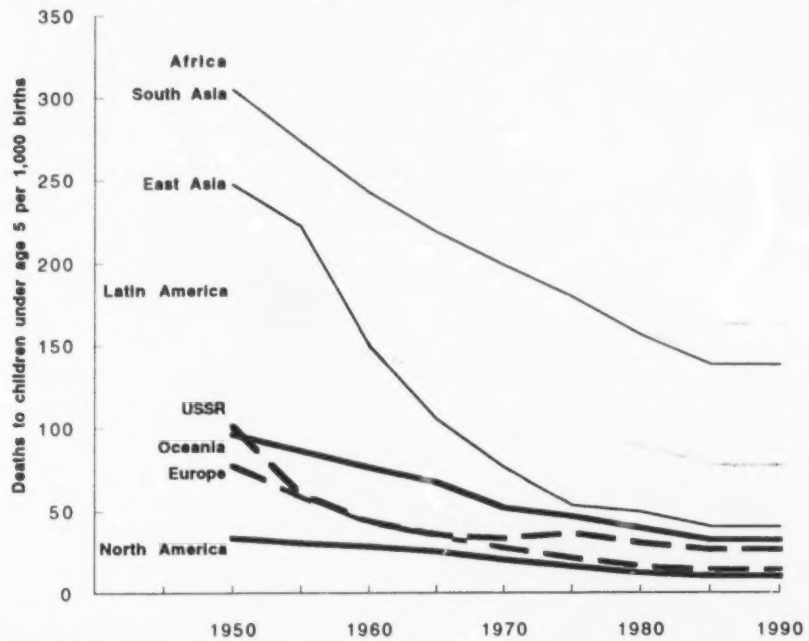
Among the more developed nations, the Soviet Union, after an early gain, actually experienced a decline in life expectancy through the 1970s, which reversed itself only in the late 1980s. Health gains in Eastern Europe also stagnated in this period. In Western Europe and Northern America (the United States and Canada), gains in life expectancy were modest during the first half of this period but have accelerated during the 1980s, primarily because of improved survival among adults and the aged. The greatest gain among industrialized countries was in Japan (included in Eastern Asia in Figure 1), which rose from the lowest (64 years) to the highest (78 years) life expectancy among developed countries over this time.

The developing world experienced divergent trends in life expectancy. Eastern Asia (dominated by China) gained a remarkable 26 years in life expectancy over this time, surpassing Latin America in the late 1960s and even the Soviet Union by the early 1980s. Among the regions of the world with the lowest levels of life expectancy in the 1950s, Africa had shown the least improvement by the end of the 1980s, gaining only 14 years, while Southern Asia gained almost 18 years. Southeastern and Western Asia (not shown in Figure 1) enjoyed even greater gains over the period, enlarging the mortality gaps between Asia and Africa.

Glaring disparities in the life expectancies among individual countries still remain. In the early 1950s, the extremes in life expectancy ranged from a low of 30 years in Sierra Leone, Angola, and The Gambia to a high of 72 years in Iceland, Norway, and The Netherlands—a gap of 42 years. In the late 1980s, life expectancies ranged from 41 years for Sierra Leone and Guinea-Bissau to 78 years for Japan—a gap of 37 years. It should be noted that low life expectancies in developing countries are in part due to high infant mortality

Figure 2

Mortality of Children under Age Five in Major World Regions, 1950-1990



Source: United Nations, *Mortality of Children Under Age 5: World Estimates and Projections, 1950-2025* (New York: UN, 1988).

rates. For example, in Sierra Leone, about 25 percent of children die before age five, compared with fewer than 2 percent of children in Japan.

The Health of Infants and Children

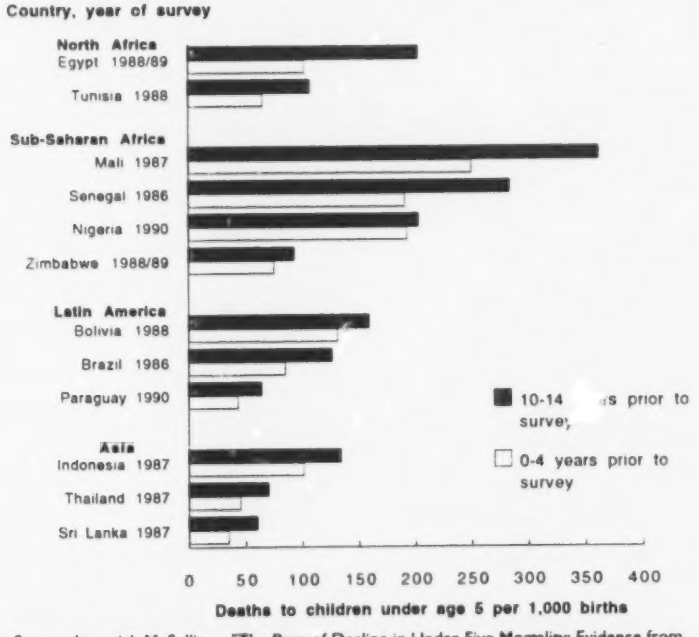
From a global perspective, infant and child mortality is overwhelmingly a problem of the developing countries in Africa, Asia, and Latin America. While these countries contain 77 percent of the world's population, in 1990 they accounted for 88 percent of the world's births and 98 percent of the world's deaths among children under age five. Based on the mortality levels for children under age five in highly developed countries, UNICEF estimates that 95 percent of the estimated 14.5 million infant and child deaths in developing countries in 1990 were preventable.[9] While only about 300,000 children under age five died in industrialized countries in 1990 (the majority in Eastern Europe and the former Soviet Union), more than 60 percent of these deaths were potentially preventable.

Worldwide, substantial progress has been made over the past four decades in improving child survival. In some regions the improvement has been dramatic. In 1950, an estimated 24 percent of the world's newborns died before reaching their fifth birthday. By 1990, the infant and childhood mortality rate (ICMR) had declined to 10.5 percent, a drop of more than 55 percent. Every region of the world shared in this improvement, with a few deviations, as shown in Figure 2, page 7. The most striking deviation was in East Asia where the ICMR in China declined from 26.6 percent to 4.1 percent, an impressive 85 percent reduction. The greatest relative reduction among the industrialized countries also occurred in East Asia; over this period, the ICMR in Japan declined from 7.5 percent to 0.8 percent, an 89 percent drop. The other remarkable deviation from the trend was the Soviet Union which, through the 1970s, experienced a rising ICMR that resumed a decline in the 1980s.

By 1990, the world regions occupied the same relative ranking by ICMR that they had in 1950—with the exception of East Asia, which dropped well below the world average over the period. The ICMR ranged from 1.1 percent in Northern America to 16.3 percent in Africa in 1990. Among individual countries it ranged from 0.7 in Iceland and Finland to 31.8 percent in Afghanistan and 29.1 percent in Mali.

Figure 3

Improvements in Mortality of Children under Age Five, Selected Countries, 1970s and 1980s



Source: Jeremiah M. Sullivan, "The Pace of Decline in Under-Five Mortality: Evidence from the DHS Surveys" (Paper presented at the Demographic and Health Surveys World Conference, Washington, DC, 5-7 August 1991).

The Mother's Role in Family Health in Developing Countries

One way to understand the large differences in child survival across countries is to look at the family, particularly mothers, as the primary "producers" of health. The survival of infants and young children is critically dependent upon the nurturing provided by their mothers both during pregnancy (see Box 2) and childhood.[10] In the past few years, the Demographic and Health Surveys (DHS) project has enlarged our understanding of the

Box 2

Low Birth-Weight Babies

When an expectant mother suffers from illness or malnutrition during pregnancy, her baby is more likely to be born underweight, putting it at risk of serious health consequences. In 1985, among an estimated 18 million births in developed countries, 1.2 million (7 percent) had low birth weight—a birth weight under 2500 grams or 5.5 pounds.[1] In developing countries, it is estimated that among 111 million births, almost 19 million (17 percent) were low birth weight. Thirteen million of these occurred in South Asia, representing 25 percent of all births. The frequency of low birth weight was 13 percent in Africa and 10 percent in Latin America.

Most low-weight births in the developing world occur among infants born after a normal period of gestation who suffer from intrauterine growth retardation (IUGR).[2] One of the major causes of IUGR is maternal malnutrition during pregnancy, often coupled with excessively heavy work, particularly during the third trimester of pregnancy. Other important causes of low birth weight are malaria infection and severe anemia related to iron deficiency, frequently aggravated by hookworm infestation. The World Health Organization estimates that 60 percent of pregnant women in developing regions suffer from anemia as compared with only 14 percent in developed regions. Short maternal stature is also a strong predictor of low birth weight.

Studies worldwide have confirmed the importance of low birth weight as a cause of infant and child mortality.[3] In Brazil, low birth-weight babies experience a death rate six times higher than normal-weight babies.[4] Longitudinal studies in Guatemala demonstrated that the higher risk of death among low birth-weight infants persisted through the first four years of life.[5] These same investigations, as well as research in other countries, document that providing additional nutrition to the mother during pregnancy will significantly reduce the frequency of low birth weight and improve child survival.

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maternal factors affecting child health and survival in many countries where vital registration data are poor (see Box 1, page 5). DHS projects have been completed in 28 countries since 1986. While these countries do not represent the entire developing world, they include some of the most populous countries in each region.

Analysis of the data from these countries reveals some consistent patterns. Over the past decade, mortality rates for children under age five declined in every country surveyed, despite the global recession and economic difficulties many of these countries experienced. By region, the average declines (weighted for the

population size of the countries) were: North Africa, 46 percent; Latin America, 32 percent; Asia, 28 percent; and sub-Saharan Africa, 12 percent. Some high-mortality countries experienced large absolute declines. For example, Mali experienced an 11 percentage point decline from 36 to 25 percent. Senegal experienced a decline in mortality under age five of 10 percentage points from 29 to 19 percent (see Figure 3, page 8).

Infant Mortality Risks

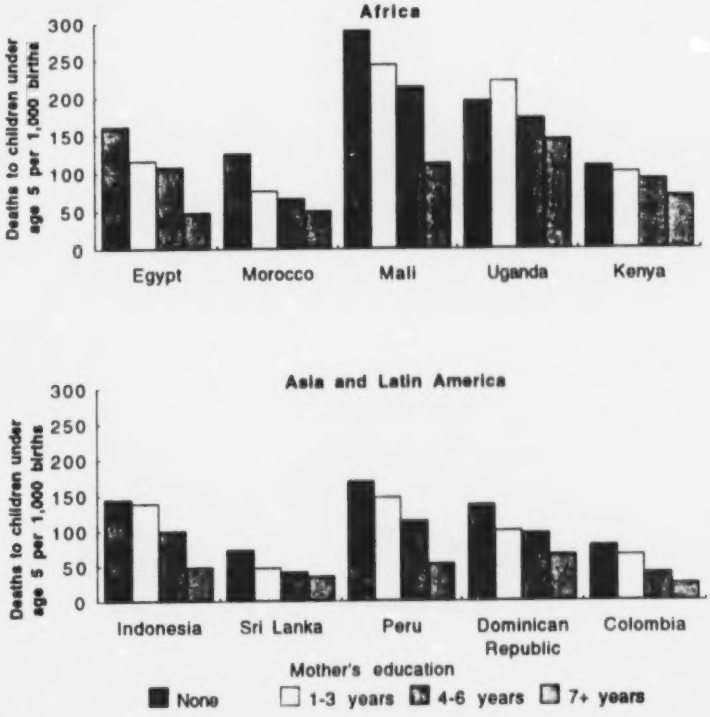
Numerous studies have found that infants are at high risk of death if they are born to mothers who are adolescents, over age 40, or have had more than seven births, and when the interval between births is less than two years. DHS data have shown that, compared with children born to women in their 20s, children of teenage mothers were 35 percent more likely to die before age one, while children born to women in their 40s were 47 percent more likely to die. Children who were seventh-born or higher were 50 percent more likely to die by age one compared with second- and third-born children.[11]

The interval between births is the most consistent reproductive factor associated with high infant and child mortality. Children born after short intervals (less than two years) were 80 percent more likely to die than children born after birth intervals of two to three years. Mortality levels among children born after long intervals (four or more years) were 19 percent lower on average than those among children born after two- to three-year intervals.

These findings suggest that family planning programs, coupled with national policies to discourage early marriage and childbearing, can substantially reduce infant and child mortality by preventing births to high-risk mothers.[12] The magnitude of the reduction will, of course, depend upon the proportion of births in the population associated with these risk factors. Various studies have estimated that family planning programs could directly reduce infant deaths by 10 to 30 percent.[13] Less tangible, but likely more powerful, are the indirect effects of family planning programs on maternal and child health.[14] When a woman gains control of her reproduction, she has more time and energy to recover her own health and to give more attention to the care of the children she already has.

Figure 4

Under-five Mortality Rates and Mother's Education, Results from Selected Demographic and Health Surveys, 1986-1990



Source: Shea O. Rutstein, "Levels, Trends and Differentials in Infant and Child Mortality in the Less Developed Countries" (Paper presented at the seminar on Child Survival Interventions: Effectiveness and Efficiency at The Johns Hopkins University School of Hygiene and Public Health, Baltimore, MD, 20-22 June 1991).

Maternal Education and Child Survival

In almost every country where it has been studied, children's chances of surviving improve as their mothers' education increases.[15] The DHS project found striking differences in mortality among children of women with differing levels of education (see Figure 4). Although variations exist between world regions, as little as three years of education is associated with 20 to 30 percent declines in the mortality of children under age five. Of course,

education levels are related to living standards—a more educated mother is more likely to have a higher income and live in better housing. Still, when statistical techniques are used to control for these differences, the role education plays in improving child survival is reduced by only one-half.

Maternal education appears to affect child health in a number of ways. Educated mothers often have been introduced to good diets and hygiene in school or by their own educated parents. A more educated mother also may have enough status and power in her family to take appropriate action when her child needs health care. The more educated a mother is, the more likely she is to use maternal and child health services—specifically prenatal care, delivery care, childhood immunizations, and oral rehydration therapy for diarrhea.[16]

This strong and consistent link between maternal education and child survival has important implications for health policy. First, it highlights the large social inequalities in survival that exist not only between but also within countries, even prosperous countries. More importantly, it reveals that even in poor countries, some families can produce a level of child survival that approaches that seen in much wealthier countries. The challenge is to extend these health gains to all people in these countries. The child-survival strategy discussed below was designed to meet this challenge.

Child-Survival Programs in the Developing World

A few major diseases cause most of the deaths among children under age five in developing countries (see Table 2). Recognizing that most of these deaths are preventable at low cost, the international community, led by UNICEF, launched a global campaign in the early 1980s to promote child survival.

The child-survival strategy is designed to reach children and families with a few life-saving technologies and information about personal health care.[17] This highly focused technical approach to public-health problems has a long history beginning with hookworm eradication at the turn of the century and including yellow-fever, malaria, and small-pox campaigns.[18]

Table 2

Causes of Death to Children under Age 5 in Developing Countries

Causes of death	Number (thousands)	Percentage of deaths
Diarrheal diseases	4,000	27.4
Immunizeable diseases	3,700	25.3
Measles	2,000	13.7
Whooping cough	600	4.1
Tuberculosis	300	2.1
Neonatal tetanus	775	5.3
Polio	25[a]	0.2
Acute respiratory infections	2,375	16.3
Malaria	750	5.1
Other infectious/parasitic diseases	450	3.1
Perinatal causes	2,425	16.6
Injuries	200	1.4
Other causes	700	4.8
Total	14,600	100.0

[a] Polio causes about 250,000 paralytic cases annually, of which about 10 percent die.

Source: Alan D. Lopez, "Causes of Death: An Assessment of Global Patterns of Mortality Around 1950," *World Health Statistical Quarterly* 43: 91-104 (1990).

Key elements in the child-survival strategy are immunizations for diphtheria, whooping cough, and tetanus (DPT vaccine), measles, polio, tuberculosis (BCG), and maternal tetanus toxoid to prevent neonatal tetanus; oral rehydration therapy to combat dehydrating diarrheal diseases; vitamin A supplementation and nutrition programs; breastfeeding promotion; birth spacing; and malaria prevention and treatment (see Box 3, page 12). The achievements of these programs in the past decade have been truly remarkable.

Immunization

In 1980, scarcely 15 percent of the children in the developing world were immunized. UNICEF's goal was to vaccinate 80 percent of the world's children by 1990. In 1989, the status in terms of percentage of children reached was BCG (for tuberculosis), 85 percent; DPT (3 doses), 75 percent; Polio, 78 percent; and Measles, 71 percent.

Only in the case of maternal immunization with tetanus toxoid has perfor-

Box 3

Combating Malaria

Although malaria is not primarily a childhood disease, more than three-quarters of an estimated 1 to 2 million malaria deaths occur annually in children under age five.

Over 40 percent of the world's population lives in countries infested with mosquitos that transmit malaria. An estimated 250 to 300 million people carry the malaria parasite in their blood, about 100 million of whom manifest the fever, extreme fatigue, or other signs of the disease. Although malaria is not primarily a childhood disease, more than three-quarters of an estimated 1 to 2 million malaria deaths occur annually in children under age five.[1]

Malaria-carrying mosquitos are found in about 100 countries throughout the world, but almost 90 percent of the malaria infections, cases, and deaths occur in sub-Saharan Africa. Malaria is the leading cause of death among children in countries like Malawi and Ghana where it accounts for 25 to 30 percent of all mortality.[2]

Early attempts at global malaria eradication in the 1950s and 1960s focused on eliminating the mosquitos that carry the disease to humans. These efforts failed because the mosquitos built up a resistance to the insecticide used against them. Presently, the key life-saving intervention in children—early diagnosis and treatment with the drug chloroquine—is being threatened because the most dangerous strain of the parasite is becoming resistant to the drug.[3] Chloroquine resistance, which was first detected in Southeast Asia more than 30 years ago, reached East Africa in the late 1970s and now is reported throughout sub-Saharan Africa.

For the future, malaria control will demand a mix of strategies requiring community participation. This may involve eliminating mosquito-breeding areas by draining swamps, selective use of insecticides, training health workers in the proper treatment of malaria, and promoting household measures. Encouraging reports from The Gambia indicate that insecticide-impregnated netting placed over infant beds may reduce infant and child mortality by up to 40 percent in malaria-endemic communities. In the meantime, research is continuing on a malaria vaccine and improved drug treatment.

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mance been far below the mark, with 44 percent coverage by 1989.[19]

Immunization coverage varies widely in the developing world, reaching 95 percent in China, 76 to 80 percent in the rest of Asia, Latin America, and the Near East, but only 53 percent in sub-Saharan Africa.[20] The accomplishments in some areas of the world have been dramatic during the past five years. China launched a nationwide immunization campaign in the mid-1980s that now has reached 95 percent of the children with all five childhood immunizations. This program extended to even the most remote provinces, which now have immunization levels of at least 85 percent.

The polio eradication program in Latin America, spearheaded by the Pan American Health Organization, has also been remarkable.[21] In 1985, Latin American countries had reached only 66 percent of the population with the polio vaccine and reported 853 cases of paralytic polio. A major eradication

program, combining periodic national immunization campaigns with stepped-up, routine immunizations and surveillance activities, increased the coverage to 87 percent by 1990. The incidence of polio declined dramatically to 14 cases in that year.

An estimated one-third of all child deaths in the developing world are caused by pneumonia and other acute lower-respiratory tract infections (ARI).[22] One-quarter of these ARI deaths can be prevented by measles and whooping cough immunizations. Pilot projects in a number of settings around the world have confirmed that more than half the remaining deaths could be prevented by early diagnosis and antibiotic therapy, some of which could be given in the home by community health workers.[23] To date, 36 countries have begun ARI programs based on these community studies. It is too early to assess the large-scale impact of these efforts, but it promises to be substantial.

Oral Rehydration Therapy

The discovery two decades ago that the oral administration of water with sugar and salt could save the lives of children suffering from dehydration due to acute diarrhea has been described as "potentially the most important medical breakthrough this century."[24] Previously, such episodes were treated with intravenous fluids, unavailable or costly in many parts of the world. Oral rehydration therapy (ORT) combats dehydration through either the use of inexpensive packets of oral rehydration salts (ORS) or a home-prepared fluid mixture. Continued feeding, including breastfeeding, during the diarrhea episode is also recommended.

In the past decade, ORT programs have been initiated in more than 100 developing countries and ORS packets are now available to 61 percent of these countries' populations.[25] Some 36 percent of diarrhea episodes are now treated through ORT.

UNICEF estimates that in 1990 more than 1 million diarrhea deaths were prevented by ORT, but an additional 2.5 million preventable diarrhea deaths still occurred. An important reason is that health professionals in many countries (including the United States) have been slow to adopt this innovation. For example, in 1988, a WHO survey of 46 developing countries documented that only 14 percent of physicians, 4 percent of nurses, 8 percent of paramedics, and 9 percent of community health workers had been trained in the ORT management of diarrhea.[26] Some countries, such as Egypt, are making extraordinary progress. Beginning in 1983, 40,000 Egyptian physicians were trained and ORS was made freely available in more than 85 percent of the health centers as well as through a national marketing program. By 1988, 80 percent of mothers knew about the dangers of dehydration from diarrhea and 50 percent had treated their child's most recent episode with ORT. The program accelerated the decline of diarrhea deaths among infants and children over the five-year period.[27]

Breastfeeding Promotion

During the first six months of life, bottlefed infants living in impoverished environments are three to six times more likely to experience diarrhea and respiratory infection as are fully breastfed infants.[28] Death rates and infant malnutrition are correspondingly higher. Maternity services and hospitals have often contributed to the decline of breastfeeding by following the Western

M A Abeyta Behnke

Breastfeeding helps ensure good nutrition and health for infants.

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medical practice of separating babies from mothers at birth. Further, few health workers have been trained in how to support mothers in breastfeeding. The problem in many developing countries has been compounded by commercial enterprises that aggressively promote breastmilk substitutes. In the late 1970s, WHO and UNICEF developed an International Code of Marketing of Breastmilk Substitutes in order to prevent the irresponsible promotion of feeding bottles and powdered baby milk. To date, however, few countries have enacted this code.

Malnutrition, while not listed as a direct cause of death, has been estimated to be a contributing factor in up to 40 percent of child deaths.

Vitamin A Supplementation and Nutrition

Studies in Indonesia, Thailand, and India have shown that administering one vitamin A capsule at intervals of one week to six months (depending on the dose) reduces early child mortality by up to 40 percent in vitamin A-deficient populations.[29] Vitamin A supplementation is now being added to a number of immunization programs as well as being used in clinical settings where it improves survival among children seriously ill with measles. At the same time, programs are encouraging mothers to add green and yellow vegetables rich in vitamin A to their children's diet.

While there is no doubt that the technical interventions described above are having a substantial impact on child survival, the more intractable problem of childhood malnutrition is limiting the net gains. An estimated 177 million children in the developing world are malnourished.[30] The prevalence of malnutrition—manifested by stunted growth and/or body wasting (severe weight loss)—ranges from highs of 42 to 47 percent in South and Southeast Asia to 26 percent in Africa, 21 percent in China, and 14 percent in Latin America.

Malnutrition, while not listed as a direct cause of death, has been estimated to be a contributing factor in up to 40 percent of child deaths. The causes of malnutrition are complex—related to a host of factors from food availability and food prices at the national level, to inadequate family income, inappropriate family feeding and dietary practices, and recurrent infections and parasitic infestations. As implied by the interrelated web of causes, social and economic interventions to promote adequate nutrition must operate at every level in the society, from national food policy to the selection, preparation, and equitable distribution of a household's food among family members.

Infant and Child Mortality in the Developed World

Preventable infant and child deaths are not restricted to developing countries; they occur in the developed world as well, particularly among minority and disadvantaged populations. In the United States, for example, there are glaring disparities in the childhood mortality of white and black populations. In 1988, the infant mortality among blacks (17.6 per 1,000) was double the level among whites (8.5 per 1,000).[31] Washington, D.C., with a majority black population, had an infant mortality rate of 21.2 per 1,000, higher than in less developed countries such as Cuba, Costa Rica, and Chile.

Social disadvantage explains most of these mortality differences.[32] In 1989, black newborns were more likely than white to have a mother with less than 12 years of education (29 compared with 21 percent). Correspondingly, black mothers were less likely to have received prenatal care in the crucial first trimester of pregnancy (60 percent versus 79 percent). Black infants were more than twice as likely to have mothers under age 18 (10 percent versus 4 percent) or to be low birth weight (13 percent versus 6 percent).

Many of these risks could be reduced by government policies to provide information and services to disadvantaged groups. For example, the teenage pregnancy rate in the United States is 10 times higher than in most European countries. In Europe, young people have greater access to sex education and contracep-

tive information and services. The U.S. government does have programs to address the nutritional and health needs of disadvantaged groups such as the Special Supplemental Food Program for Women, Infants, and Children (WIC). WIC has proven cost-effective in preventing low birth weight and reducing infant and child mortality.[33] In recent years, however, WIC funding has not been sufficient to keep pace with the growing numbers of eligible women and children.

Health in Childhood

As a child grows older and the immune system matures, the risk of death from acute infectious diseases declines substantially: age-specific death rates typically reach their lowest levels between the ages of 5 and 14. Still, an estimated 1.7 million children in this age group die each year worldwide, 97 percent in developing countries. More than 98 percent of these deaths are preventable.

In the poorer developing countries, acute infectious diseases such as pneumonia, meningitis, and rheumatic fever continue to a take a toll among children. Typically, childhood is when the heaviest loads of intestinal parasites are acquired.[34] In areas with poor sanitation, the prevalence of *Ascaris* (roundworm) and hookworm can reach 80 to 90 percent in older children and young adults. Where the intermediate snail host exists, schistosomiasis (bilharzia) can reach the same levels. These intestinal worms do not multiply in humans; rather, repeated exposure to the eggs or larvae in soil and water contaminated by feces leaves people with high levels of worm infestation. Worms can produce acute intestinal problems, severe anemia, general debility and—with schistosomiasis—chronic liver damage in adults.

Drugs can be used for mass therapy. One dose a year in schools or communities is a cost-effective means of reducing the burden of these worms and slowing transmission to others. In the long run, measures to reduce fecal contamination of the environment will be needed to interrupt transmission.

Young adulthood often means risk-taking behavior—and higher rates of injury and accidental death.

In the developed world, unintentional injuries have replaced infectious diseases as the greatest health concern in children. For example, in the United States nearly half of all childhood deaths are due to injuries; about half of these stem from motor vehicle crashes. Recognizing this, all 50 states now require safety restraints for young children—contributing to declines in motor vehicle injury deaths. Since 1970, the rate of deaths from motor vehicle crashes has declined 41 percent for children ages 1 to 4, and 31 percent for those ages 5 through 14.

Youth and Young Adulthood: The Critical Transition

Adolescence and youth is a formative period when many life-long behaviors are adopted. Behavior patterns young

Box 4

Tobacco: A Global Health Problem

Worldwide, about half the adult males and 10 percent of adult females smoke, and the rate is increasing at 2 percent per year, largely in developing countries.[1] The health consequences of tobacco addiction are staggering. Each year in the United States cigarette smoking causes more deaths than all of the following combined: alcohol, cocaine, heroin, homicide, suicide, automobile accidents, and AIDS. Overall, 20 percent (434,000) of the 2.17 million deaths in the United States in 1988 were attributed to smoking.[2]

Tobacco's annual mortality toll is estimated at 2.5 million deaths, a figure projected by the World Health Organization to rise five-fold over the next 50 years, primarily in the developing world. Rates for chronic diseases associated with smoking are at least ten times greater.

Smoking should be considered the most serious health problem among young people worldwide even though the cancers, cardiovascular and other diseases related to tobacco consumption are not manifest for an average of two decades. Tobacco promotion is heavily targeted to young people. Recent U.S. surveys show that 85 percent of adults addicted to tobacco started smoking regularly before age 20.[3] Studies from other developed countries show that smoking patterns are already well established by ages 20 to 24.

In the United States, the prevalence of smoking has been declining since the Surgeon General's Report on "Smoking and Health" in 1964. The decline resulted from the concerted effort of local, state, and federal authorities, health professionals, and citizens guided by thousands of articles on the adverse health effects of smoking. In 1965, 53 percent of white men and 38 percent of white women ages 18 to 24 smoked. But, cigarette smoking declined much more rapidly among U.S. males, narrowing the difference by gender. By 1987, just under 30 percent of young white men and women smoked.

Public-health measures to control smoking in the United States after 1965 began with warning labels on cigarette packages. These warnings were strengthened in the ensuing years, followed by requiring the labeling of tar and nicotine levels and, in 1971, a ban on radio and television advertising of cigarettes. In recent years, bans on smoking in public places have increased.

In the past two decades, most Western industrialized countries have adopted measures to discourage smoking, resulting in 10 to 30 percent declines in cigarette consumption. Yet in Eastern Europe and the former Soviet Union, where smoking has not been discouraged, cigarette consumption increased 20 to 30 percent in recent decades.[4]

A few developing countries, like India, have passed laws to reduce tobacco consumption. Nigeria has banned smoking anywhere in public, including outdoors. Most countries have not yet taken steps to discour-

people develop affect their health in two ways: in the short term, by the injuries and violence that kill and disable many as they pass through this period and, in the long term, as they adopt lifestyles that will profoundly affect their health many years later. Particularly relevant to health are smoking (see Box 4), and alcohol and substance abuse.

In the United States, the three leading causes of death among young persons ages 15 to 24 are accidental injuries (primarily from motor vehicle accidents), homicide, and suicide. In sharp contrast to deaths from infections, the deaths from these more social causes have been rising for decades.

Motor vehicle accidents account for three-quarters of all deaths from

age smoking. China is a case-in-point. China, which produces nearly 50 percent of the world's tobacco and nearly one-quarter of the world's cigarettes, has had an open door to foreign tobacco corporations. The China-American Cigarette Company, a joint venture, opened in 1988 with a production capacity of 2.5 billion cigarettes per year. The foreign companies are also exporting western advertising strategies to China.[5]

More than 250 million people in China smoke, most commonly men. Half of the global increase in tobacco use from 1976 to 1986 occurred in China. As in the West, most Chinese smokers report having begun smoking between the ages of 15 and 24. Based on the current smoking levels in China, an avalanche of smoking-related deaths over the next several decades is predicted.[6] Of the Chinese children alive today, an estimated 50 million will eventually die from tobacco-related diseases given current trends.

Japan, Taiwan, and South Korea are the other Asian countries where transnational tobacco companies aggressively market their products. The U.S. government has threatened trade sanctions unless U.S. tobacco products were accepted and cigarette advertising permitted. The advertising is primarily aimed at youths, resulting, for example, in a sharp increase in smoking among adolescents in Taiwan.

In 1989, an international coalition of health and consumer groups was able to persuade the U.S. government to abandon efforts to get Thailand to remove controls on U.S. tobacco imports. Former U.S. Surgeon General C. Everett Koop commented on these events on national television: "It is reprehensible for industrial nations to export disease, death, and disability in the way of cigarette smoke to developing countries, putting on their backs a health burden that they will never be able to pay for 20 to 30 years from now."

Half of the global increase in tobacco use from 1976 to 1986 occurred in China.

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unintentional injuries in the 15- to 24-year age group. More than half of all fatal crashes involve alcohol use.

Homicide is the number one cause of death among black youths. The homicide rates among black males ages 15 to 24 are almost 10 times higher than among white males—11.5 deaths per 1,000 population among white males in 1988, compared with 101.8 deaths per 1,000 among black males. Socioeconomic factors explain much of this racial difference. Homicide rates increased substantially between 1950 and 1988, growing from 3.7 to 11.5 per 1,000 for whites and from 58.9 to 101.8 per 1,000 for blacks. Proportionally the increase was greater among white youth. This means that the actual increase in the number of deaths was about the

same among white youth and black youth, because there are more than five times as many whites as blacks in the United States.

About half of all homicides are associated with alcohol use and about 10 percent are related to drug use.[35] More than half of all homicide victims are relatives or acquaintances of their killers, and most are killed with firearms. The United States—which has few restrictions on the sale of handguns and other firearms—has the highest firearm mortality rate of any developed country in the world.

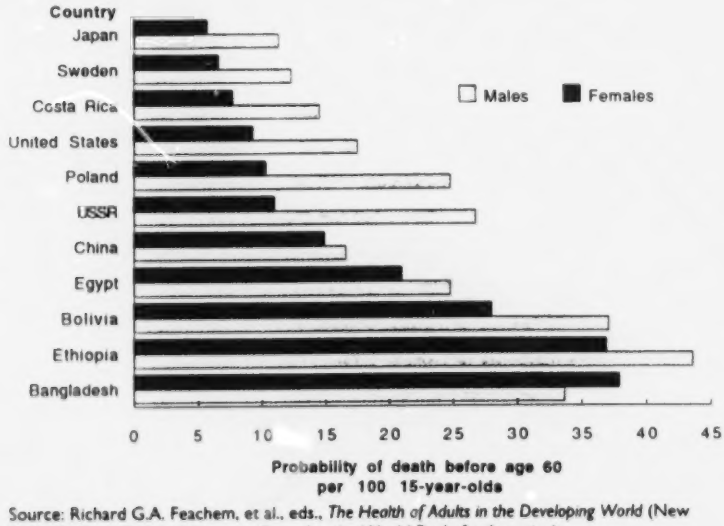
Injuries in the Developing World

Accidents, injuries, and poisoning account for an estimated 6 percent of deaths in developing countries.[36] This is about the same proportion as in developed countries (7 percent). But, disability from injuries is substantially higher in developing countries.

The trend in injuries in developing countries is difficult to ascertain because of lack of data. One thing is certain: Because deaths from infectious and parasitic diseases have fallen, injury has emerged as the most important cause of death among children and adults up to age 40. Also, some of the trappings of modernization—such as increased traffic and rapid, often unregulated construction—introduce new hazards to burgeoning urban populations. As an example, in Taiwan, unintentional injuries rose from the seventh to the third leading cause of death between 1960 and 1977. The injury mortality rate increased almost 50 percent in this time. In Saudi Arabia, the dramatic increase in the number of roads and vehicles over a period of two decades has been associated with a nearly 600 percent increase in morbidity and mortality due to motor vehicle crashes. In other situations, modernization introduces safer methods or techniques and can reduce injuries. For example, in Nigeria, mechanization of coal mines was linked to a 60 percent reduction in mining injuries.

Figure 5

Risk of Dying before Age 60 for 15-year old Males and Females from Selected Countries, 1980-1990



Source: Richard G.A. Feachem, et al., eds., *The Health of Adults in the Developing World* (New York, Oxford: Oxford University Press for the World Bank, forthcoming).

Adult Health

Working-age adults—defined here as persons ages 15 to 65—are an important group from a health perspective. Not only do they make up two-thirds of the world's population, but disease and disabilities in this group have a major impact on the welfare of families and the economy.

Perhaps the most important but least-noted health "breakthrough" in recent years has been the growing recognition that many chronic diseases among adults are not the inevitable consequences of aging but are the result of lifestyles and behaviors that can be changed.[37] All the biological mechanisms are not fully understood and for many chronic diseases (for example, cancer and coronary heart disease) multiple risk factors interact in complex ways. Still, informing the public that reducing dietary fat and salt, avoiding obesity, exercising, sleeping and eating regularly, using alcohol moderately and avoiding tobacco, has had a major effect on lifestyles in many developed countries. And the effect of these lifestyle changes can be measured in declines in some of the leading causes of death.[38]

One way to compare health conditions among adults in different coun-

tries is to consider what proportion of persons who reach age 15 will survive to age 60. Figure 5 presents these data from selected developed and developing countries that illustrate some of the regional and country variations in adult survival. Japan, with an average life expectancy at birth of 78.3 years sets the world standard. Only 11 percent of males reaching age 15 may expect to die before age 60. The corresponding risk for females is 6 percent. For industrialized countries, such as Sweden and the United States, mortality risks are somewhat greater, ranging from 12 to 18 percent for males and 6 to 9 percent for females.

A different picture emerges in Eastern Europe and the former Soviet Union, particularly for men. While female mortality risks for Eastern Europeans are only about 2 to 4 percentage points higher than their counterparts in the Western industrialized countries, male mortality risks run 10 percentage points higher.

Among the developing countries, there is greater variability. Sub-Saharan Africa lies at one extreme. In many countries more than 30 percent of the females and 40 percent of the men of working age will die before age 60. These figures do not take into account the emerging AIDS epidemic, projected to substantially increase death rates in this age group, particularly in sub-Saharan Africa (see Box 5, page 20). In South and Southeast Asia, the percentage of 15-year-olds expected to die before reaching age 60 ranges from the upper 20s to the low 30s. The risks are somewhat lower in the Middle East and lower overall in Latin America, with some variation. At the extremes are Bolivia, where 37 percent of the males and 28 percent of the females age 15 are projected to die before age 60, and Costa Rica, where only 15 percent of the males and 8 percent of the females will die prematurely.

The remarkable improvements in survival in China are reflected by a male mortality risk of 17 percent, equivalent to the levels in Western Europe; however, females in China have not gained as much. At 15 percent, their mortality risk is almost double that of their European counterparts, reflecting the lower status of women in Chinese culture. Chinese females have poorer diets, receive less health care, and have fewer educational and occupational opportunities than do Chinese males.

Adult Health in Developed Countries

Many people assume that once a country reaches a high level of development, overall health conditions will steadily improve or at least remain stable, barring unforeseen disasters or new epidemics such as AIDS. Over the past three decades, the experience in industrialized countries has been somewhat different.[39]

Throughout the Western world and Japan, adult mortality has declined progressively since 1950 for both sexes, contributing in large measure to the overall gains in life expectancy depicted in Figure 1, page 6. In Eastern Europe and the Soviet Union, health conditions stagnated in the 1970s with only slight gains emerging in the late 1980s. In the Soviet Union there was actually a four-year loss in life expectancy (from 66.1 to 62.3 years) between the mid-1960s and the early 1980s.

The distinct feature of this decay in health status in Eastern Europe and the former Soviet Union was that it was heavily concentrated among males, particularly adult men. For the most part, health conditions among women tended to improve modestly or at least not decline significantly. As a result, the gap in life expectancy between males and females in these countries widened dramatically.[40] For example, in the Soviet Union in 1964-65, the life expectancy for men peaked at 66.1 years when female life expectancy was 73.8 years, a gap of 7.7 years. By 1980-81, male life expectancy had declined to 62.3 years while female life expectancy dropped slightly to 72.5 years, increasing the gap to 10.2 years.

The negative health trends among men in Eastern Europe have been attributed to increases in alcohol consumption and smoking, deterioration in diets, growing pollution, and an

continued on page 22

Box 5

Sexually Transmitted Diseases, HIV Infection and AIDS

Until the advent of acquired immunodeficiency syndrome (AIDS) in the 1980s, health programs generally accorded sexually transmitted diseases (STDs) a relatively low priority. This was particularly true in developing countries despite the serious health problems these diseases cause.[1] For example, it has been long recognized that a high prevalence of infertility (ranging from 10 to 30 percent in some areas) in a belt that extends across Central and Eastern Africa is related to high STD rates. Likewise, approximately 80 percent of an estimated 470,000 new cases of cervical cancer each year occur in developing countries.[2]

There are more than 50 STDs. The most commonly reported are gonorrhea, syphilis, and genital herpes, which may produce serious complications including pelvic inflammatory disease, sterility, premature delivery, infections in the newborn, and death. Other STDs include: *Chlamydia Trachomatous*, a leading cause of pelvic infection and sterility in some populations; hepatitis B virus, which causes liver disease and liver cancer; and human papilloma virus, which may be the primary cause of cervical cancer. In the 1990s, AIDS is the most publicized STD.

The first case of AIDS was recognized in the United States in 1981. Because of the several-year lapse between infection with human immunodeficiency virus (HIV) and the onset of the disease, it is now known that HIV was circulating in different countries in the 1970s. During the 1980s, HIV spread rapidly throughout the world. By 1990, 323,000 AIDS cases had been officially reported to the World Health Organization (WHO) from 153 countries. WHO estimates the actual number was closer to 1.2 million with an estimated 5 to 10 million persons infected with HIV. WHO projects that by the year 2000, adult AIDS cases will rise from the present level of under 100,000 per year to over 800,000 per year and that adult HIV infections will reach 13 million worldwide.[3]

HIV is transmitted in three ways: sexual intercourse; exposure to HIV-infected blood, blood products, or donated organs and semen (through transfusions of unscreened blood, or use of unsterilized needles and syringes, for example); and from an infected woman to her fetus or infant. WHO describes three epidemiologic patterns of HIV infection:

Pattern I: The major affected groups are homosexuals or bisexual men and intravenous (IV) drug abusers. This pattern has been typical of Western Europe, North America, parts of South America, Australia and New Zealand.

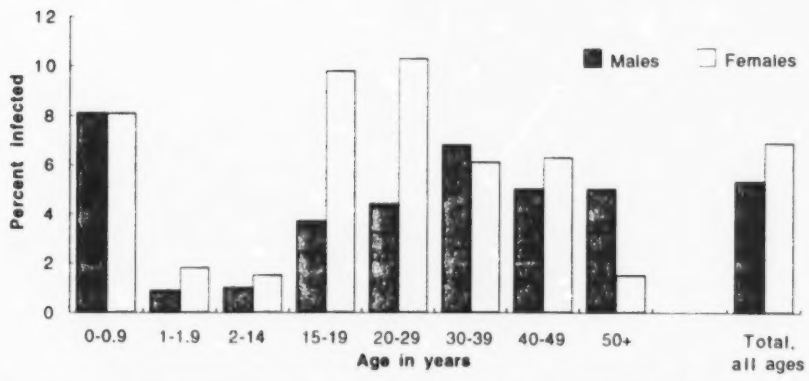
Pattern II: Heterosexuals are the main group affected. This is typical of sub-Saharan Africa, the Caribbean, and parts of South America.

Pattern III: Prostitutes and IV-drug users account for most cases. This pattern is typical of countries where HIV has recently been introduced. Much of Asia, the Middle East, and Eastern Europe fit this pattern.

The AIDS epidemic is particularly severe in sub-Saharan Africa and is projected to have major social and economic consequences.[4] While data are scarce, surveys in a dozen African cities show 5 to 30 percent of adults infected with HIV. The figure above demonstrates an infection pattern typical of heterosexual transmission in Kinshasa, Zaire. Infection rates are high among younger women, older men, and children under age one—infected by their mothers.

Many factors have hastened the spread of STDs and AIDS in sub-Saharan Africa in recent years. Increasing urbanization disrupted traditional social systems that controlled sexual activity, rural

HIV-seroprevalence Kinsasha, Zaire 1984-1985



Source: T.C. Quinn, et al., "AIDS in Africa: An Epidemiologic Paradigm," *Science* 234 (1986): 955-963

poverty compelled people to migrate, the few educational and employment opportunities for females contributed to prostitution, and, in some African countries, a low ratio of women to men in cities produced a high demand for prostitutes.

AIDS is already having a major impact on health systems. In sub-Saharan Africa, over half the admissions to many hospitals are AIDS related. TB cases are rising because of HIV infection.

Given the trends of HIV infection in sub-Saharan Africa, analysts project a doubling or tripling of adult mortality and a 20 percent rise in infant mortality within 25 years. By 2000, an estimated 10 million uninfected children will be orphaned as their parents die from AIDS.[5]

WHO is coordinating a global effort to control the AIDS epidemic. In industrialized countries, blood and blood products are now well protected; and homosexual men are practicing safer sex. Media campaigns communicate the risks of HIV and promote safer sex among the general public. Condom use is being promoted worldwide.

Numerous obstacles block progress on these fronts. Reaching poor populations in developing countries is difficult; so is reaching IV-drug abusers in developed countries and motivating them to change deep-rooted behaviors.

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increase in the number of accidents.[11] For example, per capita tobacco consumption increased by 20 to 30 percent in Eastern Europe through the 1970s and into the early 1980s, in marked contrast to the 30 to 40 percent decline seen in Western Europe and the United States due to the institution of tobacco control measures. As a consequence, deaths due to diseases of the heart, and of the respiratory and digestive systems increased in Eastern Europe.

Coronary heart disease (CHD) exhibits the characteristics of a disease strongly linked to lifestyle (see Figure 6). CHD is predominantly a male disease, in part reflecting the heavier tobacco consumption by men in most countries.[12] The CHD mortality rates vary by a factor of 10 across countries, being lowest in Japan and highest in countries such as Finland and England and Wales. The rate is six times higher in the United States than in Japan. Interestingly, Japanese who resided in Hawaii and the continental United States have CHD mortality rates between the low levels of Japanese residents and the high levels of white U.S. residents.[13] These findings suggest that lifestyle plays a larger role in CHD mortality than does ethnic background.

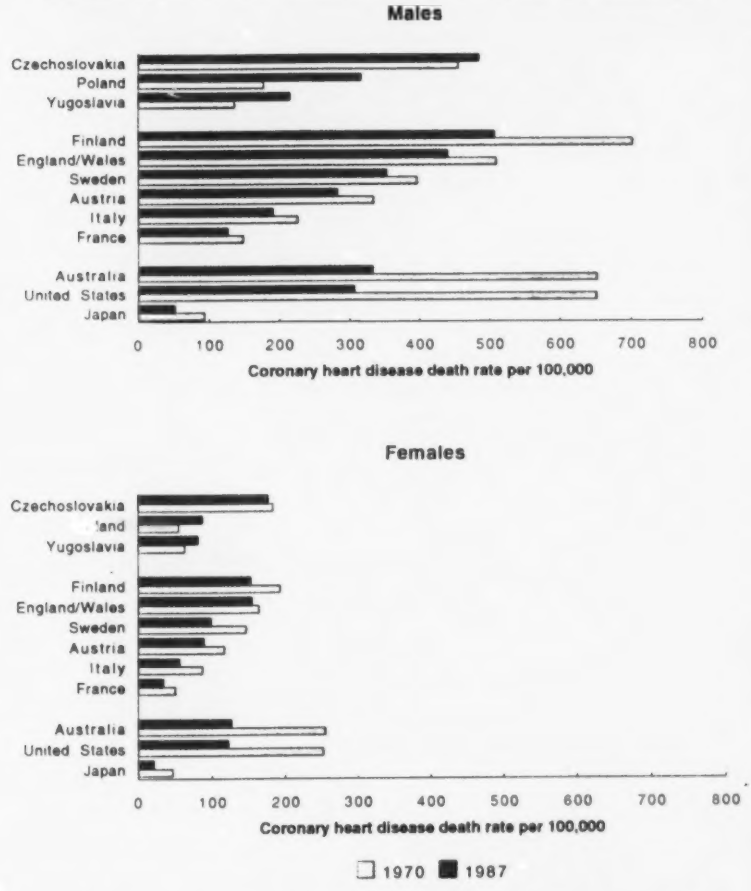
Deteriorating living standards in Eastern Europe may explain why mortality from CHD has increased for men in the former Soviet Union and all the Eastern European countries, while it has declined sharply in 20 out of 22 Western countries.[14] The United States, Australia, and Finland were among the countries that enjoyed dramatic declines in heart disease deaths over the period, as shown in Figure 6.

By the mid-1980s, the Soviet Union and Eastern European countries had the highest death rates of all industrialized countries for diseases of the circulatory, respiratory, and digestive systems, and injuries.[15] The particularly high male mortality from these causes explains most of the gap between male and female adult mortality. In the mid-1980s, the Soviet Union began taking strong measures to reduce alcohol consumption—with some success.[16] Within the next two years the impact of lower consumption was associated with a 36 percent decline in Soviet mortality from accidents and poisonings (including alcohol).

The United States may be taken as an example of the trends in adult health seen in the Western countries. Beginning in the 1960s, Americans became more health conscious. A precipitating event was the 1964 Surgeon General's Report alerting the American public to the health risks of cigarettes. Within two years, cigarette consumption peaked—after rising for more than six decades—and then began an uninterrupted decline.[17] At the same time, the public was becoming increasingly aware of the scientific

Figure 6

Coronary Heart Disease Death Rates in Developed Countries, Men and Women Ages 35-74, in 1970 and 1987



Source: Based on data from the World Health Organization, *World Health Statistics Annual* (Geneva: WHO, various years).

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Americans' pursuit of healthier lifestyles—more excercise, better diets, and less smoking—helped reduce adult mortality.

evidence linking diet and heart disease. This was given added impetus in 1974 when the Canadian Minister of National Health and Welfare issued, "A New Perspective on the Health of Canadians," emphasizing a preventive approach centered on lifestyle and behavior changes.[48]

In 1975, the U.S. Centers for Disease Control convened a group of 40 health professionals to look at the 10 leading causes of death in the United States and assess the relative role various risk factors play in contributing to mortality.[49] The group concluded that lifestyle made up nearly half (49 percent) the mortality risk. Of the remainder, they determined that heredity and biological factors made up 26 percent; environment, 16 percent; and health systems, 11 percent.

All these findings were translated into a major national initiative in 1979 when the U.S. Surgeon General issued "Healthy People: The Surgeon General's Report on Health Promotion and Disease Prevention."[50] This document examined the risks to good health in the United States and explicitly defined areas for health improvement grouped under three strategies: preventive health services, health protection, and health promotion. These included behavioral changes related to smoking, alcohol and drug abuse, diet and exercise, and health protection including occupational safety and accident prevention; as well as preventive health services such as immunizations, family planning, and improved management of high blood pressure.

The transformation in the public's behavior has been dramatic, although inadequate among people in the lower income groups. Since 1963, tobacco consumption declined by more than 40 percent; the use of butter, whole milk, and cream declined by 25 to 30 percent, and the use of animal fats and oils dropped by 40 percent. At the same time, vegetable fat and oil use increased by 60 percent and fish consumption by more than 25 percent. In 1987, an estimated 30 million Americans reported they practiced regular aerobic activity.

The health impact of these changes has been substantial. The U.S. death rate (adjusted for changes in age structure) took a sharp downturn in the late 1960s after stagnating for more than a decade. This decline was largely a result of substantial reductions in mortality from chronic diseases among adults. For example, heart disease, the leading cause of death among adults ages 25 to 65 in 1950, declined dramatically.[51] As shown in Figure 6, the death rates for coronary heart disease declined by more than 40 percent between 1970 and 1987 for Americans ages 35 to 74. Stroke death rates dropped by more than 50 percent. As a result, cancer became the leading cause of death in this age group in 1987 followed in order

The encouraging news is that lung cancer has declined among young people, reflecting their lower rates of smoking.

by: heart disease; injuries; stroke; suicide; liver disease; chronic lung disease; homicide, HIV infection (AIDS); and diabetes.

Overall cancer mortality rates have changed very little since 1950 because cancer is really many diseases associated with a variety of risk factors. There have been significant changes for some specific cancers, however. Lung cancer mortality, 85 percent of which is due to smoking, more than tripled since 1950. The encouraging news is that lung cancer has declined among young people, reflecting their lower rates of smoking. Among men, lung cancer mortality began to decline in 1963 for the age group 30-34. As this group aged, rates declined in progressively older age groups. In 1969, rates declined among the 35-39 age group, in 1971 among those ages 40-44, in 1976 among those ages 45-49, and by 1980 small declines were beginning in the 50-54 and 60-64 age groups. For those over 65, however, rates have continued to increase, reflecting a lifetime of heavy tobacco consumption.

Among women, lung cancer surpassed breast cancer to become the leading cause of cancer mortality in the late 1980s. Lung cancer has increased among older women because they began smoking later and a smaller proportion have quit. The age-specific mortality decline in lung cancer for women under 45 has just begun since 1979.[52] Breast cancer occurs more than twice as often as lung cancer; however, with early diagnosis, women have a better chance of surviving breast cancer.

The most important exception to this pattern of improving health is the dramatic increase in deaths due to AIDS. The first case in the United States was diagnosed in 1981; by 1990 it had become the 11th leading cause of death for Americans of all ages.

Adult Health in Developing Countries

Compared to the industrialized world, little is known about adult health in developing countries. The lack of knowledge is a serious handicap for international health policymaking given that 75 percent (2.4 billion) of the estimated 3.2 billion persons in the 15-

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China has made remarkable improvements in adult health and survival since the 1950s.

64 age group lived in developing countries in 1990 (see Table 1, page 3). In the next 30 years, the number of persons in this age group will increase at more than three times the rate of the younger population, reaching 4.4 billion by the year 2015. This 81 percent increase contrasts with a projected increase of only 8 percent in this age group in the developed countries over the same time.

Over the past four decades, adult survival in all regions of the developing world has improved steadily, paralleling the overall gain in life expectancy. The most dramatic improvement has been in China; the least improvement in sub-Saharan Africa. At present, the likelihood of death between ages 15 and 60 in developing countries averages about 23 percent. A continuing decline in mortality rates is projected; however, because the populations are growing so rapidly, the number of adult deaths will increase. In 30 years, 50 percent more deaths and correspondingly more illnesses are projected. This demographic fact led the World Bank to conclude in a recent study that "the central adult health problem is the rising absolute number of adults who are sick and dying" in spite of progressively declining death rates.[33]

There is a great diversity of diseases in this age group, the result of a convergence of two separate processes.[34] First, there are infectious diseases. Although these are fading as social and economic conditions improve, adults living today experienced more infectious and parasitic diseases in their childhood 30 to 50 years ago than do children today. Many of these diseases have left residual disabilities (for example, lameness with polio, blindness with trachoma, hearing loss from ear infections) or progressive consequences (for example, rheumatic heart disease, liver cirrhosis due to schistosomiasis) and, in many cases, active infections with progressive disease (for example, tuberculosis, hepatitis B).

Second, adults in developing countries are being exposed to the growing health risks of an industrializing society—including higher consumption of tobacco, alcohol, and dietary fat, motor vehicle accidents, occupational injuries, chemical pollutants, and violence. In effect, the developing countries are now entering or, in some cases (for example, China, Brazil, and Mexico) have already entered, a very complex stage that presents unprecedented challenges to their health systems.[35]

Table 3

Percentage of Deaths from Selected Causes in India and China, Men and Women Ages 15-59

	Percent			
	India, 1986[a]		China, 1988	
Cause	Males	Females	Males	Females
Communicable diseases	**35.0**	**31.3**	**7.8**	**7.1**
Tuberculosis	17.8	10.9	3.8	3.5
Reproductive diseases	-	**9.3**	-	**1.8**
Non-communicable diseases	**45.2**	**43.3**	**72.0**	**70.3**
Circulatory	15.3	12.6	27.4	30.4
Cancer	4.4	6.7	27.3	24.6
Respiratory	8.3	7.7	3.4	3.2
Digestive	9.1	8.9	7.5	5.6
Injuries	**19.8**	**16.1**	**20.1**	**20.9**
Unintentional	12.1	10.9	14.3	10.9
Intentional	4.1	3.8	5.7	10.0
Probability of death between ages 15 and 65 (per 100)	32.8[b]	29.4[b]	14.3	11.9

a= Ages 15-54 in India
b= Estimated for India from life table
Source: Richard G.A. Feachem et al., eds., *The Health of Adults in the Developing World* (New York, Oxford: Oxford University Press for the World Bank, forthcoming).

India and China illustrate the diversity of diseases that may be seen in two developing countries with very different mortality levels (see Table 3). The risk of death between ages 15 and 65 in India is more than double that in China. While these data are not fully comparable, they do illustrate distinct patterns. Chronic noncommunicable diseases are the leading causes of death in both countries. In China, however, diseases of the circulatory system and cancer account for 55 to 60 percent of all deaths, while in India they account for less than 20 percent. Deaths from communicable diseases such as tubercu-

Table 4

Probability of Death by Cause for Chinese Men between Ages 15 and 60, 1987 Estimate

Cause	Probability of death (x 100)
Cancer	**4.3**
Liver	1.2
Stomach	0.9
Esophagus	0.7
Lung	0.6
Accidents	**2.7**
Motor vehicle	0.6
Falls	0.6
Cerebrovascular disease (stroke)	**1.7**
Respiratory diseases	**1.7**
COPD*	1.6
Heart disease	**1.5**
Coronary heart disease	0.7
Rheumatic heart disease	0.4
Hypertensive heart disease	0.2
Digestive diseases	**1.3**
Chronic liver disease	0.8
Infectious diseases	**1.1**
Tuberculosis	0.7
Suicide	**1.0**
Homicide and war	**0.3**
Endocrine	**0.1**
Diabetes	0.1
All causes	**15.0***

*COPD= chronic obstructive pulmonary disease. Pulmonary heart disease is included here.
Source: See Table 3.

losis are about four to five times higher in India. Reproductive mortality among women is also much higher in India, reflecting higher birth rates and the poorer health system. Proportionally, injuries contribute about the same to mortality in both countries.

Limited data are available from high-mortality areas in sub-Saharan Africa. However, a small longitudinal study carried out in rural Machakos, Kenya in 1975-78 found adult disease patterns similar to those in India.[56] Communicable diseases accounted for 35 percent of deaths; 16 percent of these were from tuberculosis. Noncommunicable diseases accounted for 43 percent of deaths and 18 percent of injuries.

Indirect evidence of mortality declines in developing countries over the past four decades can be derived from demographic analyses of censuses and surveys. However, direct evidence of how the causes of death have changed is extremely scarce, especially from high-mortality areas such as sub-Saharan Africa. The World Bank study cited above was able to examine longitudinal vital registration data from Chile, Costa Rica, Cuba, Singapore, and Sri Lanka from the 1950s to the present. These records indicated that the overall declines in mortality among adults were associated, in order of importance, with reductions in deaths from: 1) infectious diseases (particularly tuberculosis and respiratory infections); 2) maternity-related conditions; 3) digestive diseases; and 4) cardiovascular diseases. Deaths due to injuries did not change and in some cases increased substantially, offsetting the gains in survival produced by a decline in infectious diseases. As a consequence, chronic diseases and injuries accounted for a growing proportion and, with expanding populations, growing numbers of deaths in these developing countries.

China, where mortality rates have dropped rapidly, illustrates the diversity in causes of death referred to earlier. The pattern shown in Table 4 appears similar to that of a developed country. For example, in the United States, among adults age 25 to 64, the four leading causes of death are cancer, heart disease, accidents, and stroke. These are also among the top five in China. Closer examination, however, reveals major differences in the specific causes of death.

In China, many of the causes of death among adults relate to diseases and exposure to infections or toxic substances early in life. The single leading *specific* cause of death in China is chronic obstructive pulmonary disease (COPD), listed under respiratory diseases in Table 4. In the United States, COPD is predominantly a male disease and is related to heavy cigarette smoking. In China the rate of COPD is 10 times higher than in the United States, occurs about as often in females as males, and is somewhat more common in the rural areas. The causes are unclear but COPD appears to be related to a heavy exposure to

indoor household smoke from open fires in combination with a high rate of acute respiratory infections.

The second leading *specific* cause of death is liver cancer, also very uncommon in the United States. Liver cancer in China results from lifelong infection with hepatitis B virus, often transmitted from infected mothers to their babies at birth. Hepatitis B is also a leading cause of chronic liver disease (cirrhosis) in China, whereas in the United States the leading cause of cirrhosis is alcoholism.

Coronary heart disease is the number one cause of heart disease death in China, similar to the United States. The second leading cause of heart disease in China is rheumatic heart disease, related to a different exposure history as well as different medical facilities. Most adult deaths from rheumatic heart disease in China are a result of chronic degeneration of the valves in the heart, a long-term consequence of untreated streptococcal infections (strep throat) in childhood. These deaths are extremely rare in the United States because of early treatment of strep infections and widespread availability of corrective heart surgery.

Tuberculosis (TB), the leading cause of infectious disease deaths in China, is also connected to childhood exposure. In large measure, TB deaths among adults represent a reoccurrence of disease from an infection acquired in early childhood.

This limited analysis demonstrates how complex health problems are among adults in developing countries. More than one-third of the leading causes of death among Chinese adults actually relate to childhood exposures. At the same time, in such a rapidly changing society, adults are also at increasing risk of motor vehicle accidents and the chronic diseases seen in the Western world—including lung cancer, coronary heart disease, and diabetes.

Although information on the causes of death among adults in most of the developing world is very incomplete, enough information is available to lead to a number of conclusions about priority health issues for the future. For example, growing urbanization is bringing a host of new health risks even as the old ones remain. Of particular concern are the problems connected with motor vehicle accidents, substandard working conditions, and the rising consumption of tobacco, alcohol, and junk foods.

Among the most serious health problems remaining in high-mortality settings, tuberculosis tops the list, accounting for about 20 percent of all adult deaths or 30 percent of all preventable deaths in this age group.[57] An estimated 3 million TB deaths occur annually—largely in the 15 to 59 age group—probably making TB the number one infectious cause of death worldwide. Newer antibiotics allowing for rapid short-course (three to six month) therapy make TB intervention programs cost-effective. The World Health Organization is leading the international community's efforts to deal with this long-neglected health problem in the developing world.

Hepatitis B is a leading cause of liver cancer throughout the developing world. Liver cancer is particularly prevalent in China, Southeast Asia, and Africa. With the recent availability of a vaccine for the hepatitis B virus costing less than US$1 per injection, there is now for the first time a vaccine against liver cancer. A number of countries, including China, Thailand, Indonesia, and The Gambia, have initiated or are planning national programs to immunize newborns.

Reproductive health, including maternal mortality and sexually transmitted diseases, generally has been neglected in much of the developing world. Recently, with a "safe motherhood initiative" promoted by WHO and the World Bank, the international community has granted higher priority to the prevention of maternal mortality. Although only about 10 percent of adult female deaths are related to childbirth, women in developing countries are from 100 to 500 times more likely to die in childbirth than women in industrialized societies. This amounts to about 500,000 maternal deaths annually, almost 99 percent of which are preventable.[58]

Among the most serious health problems remaining in high-mortality settings, tuberculosis tops the list, accounting for about 20 percent of all adult deaths

Figure 7

Survival to Ages 5 and 80 at Different Levels of Life Expectancy

Source: Ansley J. Coale, Paul Demeny, and Barbara Vaughan, *Regional Model Life Tables and Stable Populations* (New York: Academic Press, 1983); and Ansley Coale and Guang Guo, "The Use of New Model Life Tables at Very Low Mortality in Population Projections," *Population Bulletin of the United Nations*, no. 30 (New York: UN, 1991).

Until the advent of AIDS, sexually transmitted diseases in developing countries were essentially ignored even though these conditions debilitated millions of people. With the AIDS epidemic, the international health community and national health authorities now are giving serious attention to reducing the burden of these conditions.

Aging, Morbidity, and Disability: A Global Concern

The world's elderly population is projected to swell by 114 percent between 1990 and 2020. The magnitude of this increase, both relatively and absolutely, is far greater in less developed than in developed countries, as shown in Table 1, page 3. The inevitable consequence over the next several decades will be a rapid shift of the health problems of the aged from more developed to less developed countries.[39] In 1990, of 330 million persons over the age of 65, 56 percent lived in less developed countries. By the year 2020, 67 percent of the 706 million persons over age 65 will live in less developed countries and this proportion will continue to increase for decades.

Declines in mortality and fertility determine the dynamics of growth of the elderly population. The likelihood that a newborn will reach age 5 and age 80 as life expectancy increases is illustrated in Figure 7. At the extremes, with a life expectancy of 30 years typical of many developing countries a few decades ago, only 60 percent of newborns survive to reach age 5 and barely 3 percent reach age 80. At a life expectancy of 80 years, more than 60 percent of newborns will see their 80th birthday!

Although the world's population growth rates are slowing, the momentum for growth associated with past high fertility remains. On the basis of this momentum, the number of people 60 years or older will grow for 60 more years after births begin to decline, the population 80 years and older will grow for 80 years and so on. For example, in the United States, people born during the peak of the baby boom (1957) will not reach age 80 until 2037. Because death rates continue to decline, chances of survival for members of a birth cohort actually improve over time. The elderly population will not only continue to grow for many more years but also grow at a faster rate than any other age group.

Declines in mortality are not only adding to the numbers of the aged but also increasing their longevity. The question of whether the human population is reaching an upper limit of survival is one that vexes demographers as well as biomedical scientists. A recent analysis of long-term trends in life expectancy suggests that, barring a biomedical breakthrough that could increase the human life span beyond about 110 years, the ceiling in life expectancy for populations may be about 85 years for females and slightly more than 80 years for males.[60]

An aging population's increased morbidity and disability have substantial consequences for national health systems.[61] To investigate this, data for all Medicare-eligible persons over age 65 (representing approximately 95 percent of the U.S. population age 65 and over) were used to assess how much of the remaining years of life among the elderly at increasing ages actually represented active life expectancy.

An aging population's increased morbidity and disability have substantial consequences for national health systems.

Box 6

"Diseases of Affluence" and the Poor

Heart disease, high blood pressure, and cancer often are considered "diseases of affluence" because they are the leading causes of death in wealthy countries. In fact, the high-risk behaviors (like obesity and smoking) associated with these diseases are generally more common among the poor. Because the poor have limited access to good medical care, deaths from these "diseases of affluence" are much higher among the poor.

In the United States, the prominence of chronic diseases among the poor is strikingly manifested by the mortality differences between whites and African Americans. White Americans enjoyed a progressive gain in life expectancy in the 1980s, reaching 76 years in 1989. For blacks, life expectancy runs about six years lower. Part of this difference relates to infant mortality but it also reflects higher death rates among adults, particularly black men.

For black women, for example, the probability of dying between ages 15 and 60 is 16 percent; 79 percent higher than for white females. For black men, the risk of death during this age range is 30 percent, almost double that for white men,[1] and approaching the level for men in Bangladesh.

Nearly two-thirds of the excess mortality among African-American men in this age group has been attributed to cardiovascular disease and injuries. While black men are at a higher risk of homicide, this accounted for only one-fifth of the total difference. Eighty-one percent of the burden of excess mortality could be related to a combination of other lifestyle factors and, particularly, lack of access to quality medical care.

These same social differences are evident in developing countries. A study of mortality among males ages 45 to 64 in Porto Alegre, Brazil, in 1986 showed death rates were 30 percent higher for the poor than the rich with more deaths due to cancers, cardiovascular diseases, respiratory diseases, and injuries. In terms of risk factors and lifestyle, the uneducated in this same city were at greater risk from hypertension, alcohol consumption, obesity, smoking and lack of exercise.[2]

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Table 5

Expected Years of Life, Active Life, and Living in an Institution for the U.S. Elderly, 1983

Age	Years					
	Total life expectancy		Active life*		Living in an institution	
	Males	Females	Males	Females	Males	Females
65	14.4	18.6	11.9	13.6	0.6	1.4
75	9.0	11.7	6.4	7.0	0.7	1.5
85	5.2	6.4	2.6	2.3	0.8	1.7
95	3.2	3.7	0.6	0.4	1.1	1.7

* Years without disability

Source: Kenneth G. Manton and Eric Stallard, "Cross-sectional Estimates of Active Life Expectancy for the U.S. Elderly and Oldest-Old Populations," *Journal of Gerontology: Social Sciences* 46, no. 3 (1991): 170-182.

These results, summarized in Table 5, illustrate how sharply disability increases with age. For example, among females at age 65, only 13.6 years (73 percent) of the 18.6 years of survival remaining are active—without disability. This drops to 36 percent of the 6.4 years remaining to U.S. women by age 85; and by age 95 only 11 percent of the 3.7 years remaining are unimpaired. While females have a longer total life expectancy at every age, after age 85, males have fewer disabilities and a somewhat longer active life expectancy than females.

As survival increases, the crucial question becomes: How much of this gain represents more years of healthy life because of the elimination of diseases and how much represents the use of new medical methods to prolong the lives of persons afflicted with chronic diseases who otherwise would die? In the first scenario the gains in life expectancy would largely be gains in healthy years, while in the second scenario the gains would largely be disabled years, a situation labeled the "failures of success."[62] Obviously these different scenarios have major implications for health systems as well as the quality of life that can be anticipated as the world's population ages. The evidence on this issue is mixed.[63]

The more pessimistic view is based on the premise that gains in survival have been achieved by therapeutic interventions that simply delayed death among chronically ill persons.[64] If this is the case, then over time not only would the numbers of the elderly increase but also the amount of disability among the elderly. These persons have been termed "new survivors" who would otherwise have died but are now maintained alive for more extended periods.[65]

Several observations support this more pessimistic view. First, developed countries have a greater proportion of disabled people at all ages.[66] For example, in Australia in 1981, 6 percent of the 5- to 14-year-olds had some disability. By comparison, the disability rates for this age group ranged from less than 1 percent in countries such as Thailand, Tunisia, and Egypt to 2 to 3 percent in rural Ethiopia and the Philippines. At the other extreme, Australia reported 35 percent of adults disabled at ages 65 to 74 compared with only about 10 to 15 percent in Ethiopia, Mali, and the Philippines. While the comparability of these surveys is questionable, it should not be surprising that persons with moderate to severe chronic diseases (for example, diabetes) are far less likely to survive in developing countries where health services are scarce.

More important, are the gains in life expectancy now occurring in developed countries due to gains in disabled years or healthy years? Studies in the United States and Canada suggest that the larger proportion of the life expectancy gain between the 1950s and 1970s was in disabled years.[67] An analysis of recent gains in life expectancy found that the answer to the question "Are Americans living longer healthy lives as well as longer lives?" depends upon the definition of health and of disability.[68] If health means the ability to fully participate in normal activities of everyday life, the answer would be "no"; most of the gain in life expectancy between 1970 and 1980 was concentrated in years with a chronic disabling illness. On the other hand, if disability refers only to years spent in bed and the increase in life expectancy is measured only up to age 85, then the answer is "yes," the gain in life expectancy

represents fewer bedridden years, although these years are not free of all disability. Either way, the results suggest that health-care systems must anticipate increased demand by a growing elderly population which will spend more years with a chronic disability.

A more optimistic view of current trends is described as the "compression of morbidity."[69] The evidence for this has been the dramatic reduction in mortality for chronic diseases in adults in recent years attributed to the prevention or postponement of the onset of these conditions rather than simply prolonging survival. For example, there have been actual declines in the incidence of heart disease, lung cancer, and automobile accidents.

"Successful aging" can be described as reducing the period between the age at which an individual suffers serious infirmity and the age at death. If medical systems continue to concentrate only on developing more sophisticated means of treating diseases after they are recognized, morbidity will increase, and health care will become more expensive. Already 18 percent of the U.S. health budget is spent on the last year of life. The alternative is to pursue even more vigorously the path of prevention and to provide social incentives to reduce risks and promote healthy behaviors.

The Relationship of Health to Wealth

A cursory inspection of the world health picture suggests that the single most important factor determining survival is income. At one extreme, Africa, with a per capita income of $600 (in U.S. dollars), has a life expectancy of 52 years while North America, with a per capita income of almost $20,000, has a life expectancy of 75 years. While a high gross national product (GNP) per capita is usually related to a high life expectancy, a number of low-income developing countries have managed to raise their average life expectancies closer to the levels of wealthier countries. Conversely, some countries with high per capita incomes still rank relatively low on measures of health and survival.

Table 6

Selected Developing Countries with High or Low Average Life Expectancies Relative to Their GNP Per Capita

Country	GNP/capita[a] U.S. dollars (1988)	Life expectancy years (1990)	Total fertility rate[b] (1990)	Percent literate Females (1985)	Percent literate Males (1985)
A. Life expectancy over 70 years with GNP/capita under $2,000					
China	$ 330	70	2.4	55	80
Sri Lanka	420	71	2.5	81	92
Jamaica	1,070	73	2.6	98	98
Chile	1,510	72	2.7	92	93
Costa Rica	1,690	75	3.2	92	92
Malaysia	1,940	70	3.7	65	83
B. Life expectancy under 65 years with GNP/capita over $2,000					
Saudi Arabia	$ 6,200	64	7.1	43	69
Libya	5,240	61	6.8	40	70
Oman	5,000	64	7.1	12	47
Gabon	2,970	53	5.5	43	70
Algeria	2,360	64	5.4	35	63

[a] Gross National Product per capita
[b] Average total number of children born per woman
Sources: World Bank, *World Development Report 1991* (New York: Oxford University Press, 1991); United Nations Development Programme, *Human Development Report 1991* (New York, Oxford: Oxford University Press, 1991)

Panel A of Table 6 lists six countries with a GNP per capita less than $2,000 that have a life expectancy of 70 years or greater. China and Sri Lanka stand out in this list with life expectancies of 70 and 71 years despite low per capita GNPs of $330 and $420, respectively. By comparison, of 21 other countries with GNPs in the range of $300 to $500, 18 have life expectancies ranging from 43 to 59 years. The six countries share a number of other characteristics which may explain their success in lengthening life expectancy. All have relatively high levels of literacy among women as well as men, indicating a long history of investment in education with attention to equity for women. Correspondingly, fertility rates are relatively low in each of these countries.

Yet, wealth does not necessarily bring health. Panel B of Table 6 lists countries that have a per capita GNP of $2,000 or greater and life expectancies less than 65 years. With one exception, all are in North Africa. Overall literacy levels are lower, but the most striking difference is

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Improving the education of women can lead to a healthier population.

between men and women, indicating the lower status of women in these societies. Correspondingly, total fertility rates are high, a reflection that women have fewer opportunities to participate broadly in these societies. The roles of women in some Islamic countries are limited to childbearing and child-rearing. The per capita public expenditures for health services in Saudi Arabia ($248) and Libya ($163) are 20 to 50 times greater than those in China ($5) or Sri Lanka ($7), suggesting that good health is not necessarily produced by spending money on sophisticated hospital care.

In 1985, the U.S.-based Rockefeller Foundation convened an international conference in Bellagio, Italy on the theme "Good Health At Low Cost" to explore why a few poor developing countries and regions manage to achieve such remarkable gains in health.[70] Selected for in-depth analyses were China, Sri Lanka, Costa Rica, and the state of Kerala in India. The latter region was chosen because, although it was among the poorest states in India (the per capita income was $160 in 1981-82), it had already achieved a life expectancy of 69 years.

The Bellagio conference concluded that good health in poor countries can be achieved if there is a political commitment to equity. This commitment must be translated into policies and programs that assure, as far as possible, wide access to basic health services, education, and food. The four case studies indicated that to guarantee access to health care, governments must work to overcome the social and economic barriers that can exist between disadvantaged groups in the population and medical services. A common characteristic in these countries was that they set their own priorities and strategies for health programs. The approach to a specific disease problem, such as diarrhea, was multifaceted—involving social and environmental interventions as well as the introduction of medical technologies through a well-managed and accessible health system.

Conclusion

In the first three decades following World War II, the major thrust of health programs was biomedical and technical. This was associated with dramatic declines in infant and child mortality in developing countries as well as significant advances in curing or prolonging the survival of persons with chronic diseases in developed countries. By the 1970s, however, there was growing evidence that a hospital-based, curative strategy was failing to meet health needs and was

increasingly expensive. At the same time, a convergence of evidence from the biomedical and social sciences was laying the groundwork for a new approach to improving the health of populations. This was manifested differently in developed and developing countries.

In developed countries, it was becoming increasingly apparent that many of the chronic diseases among adults were not the inevitable consequence of modernization but rather the result of unhealthy behaviors, diet, and lifestyle. The Canadian Minister of Health issued a White Paper in 1974 which documented the relationship between lifestyle and disease. The following year, the U.S. Centers for Disease Control issued a study which estimated the proportional allocation of factors contributing to mortality from the 10 leading causes of death; unhealthy lifestyles contributed about 50 percent while impairments in the medical system accounted for only 11 percent. In 1979, the U.S. government moved closer to a national program of health promotion and disease prevention with the publication of "Healthy People: The Surgeon General's Report on Health Promotion and Disease Prevention." Other industrialized countries were developing strategies for promoting healthier lifestyles. The efforts by Western countries have resulted in substantial improvements in health, especially among adults, in the 1980s.

In developing countries, it was also becoming clear by the 1970s that the Western medical model of urban-based hospitals and health centers was not meeting the health needs of the people. But a few countries—whose health systems focused on reaching all the people with essential services and promoting basic hygiene and good dietary practices—were achieving substantial health gains. These successful examples led UNICEF and the WHO to convene an International Conference on Primary Health Care in 1978 in Alma Alta, then in the Soviet Union, which emphasized community-based health programs and universal access to essential services.

In the 1980s, the primary health care movement was translated into a global child-survival strategy by the international donor community. This strategy sought to bring the world's children a few effective technologies—such as immunizations and oral rehydration therapy to combat diarrhea—along with information on breastfeeding, nutrition, and hygiene to reduce mortality from infectious diseases. The achievements toward this goal have been remarkable.

The promotion of healthy lifestyles in developed countries and the child-survival campaign in developing countries should be looked on as the precursors of a revolutionary shift in worldwide health policy and program strategy. This preventive approach to improving health recognizes that all sectors of society must be involved in the production of health, not just the medical profession or government health department. These new strategies to promote health will be political, economic, and social, with the objectives of reducing environmental hazards, providing information and basic services, and motivating persons so that health risks and unhealthy behaviors are reduced, precursors to disease are identified early, and healthy lifestyles become the norm.[71]

The biomedical and social sciences will be needed more than ever before to move this new strategy forward: the biomedical sciences to increase knowledge about the precursors of disease and to develop and improve technologies for disease control on a population-wide basis; the social sciences to learn how to apply this knowledge to health problems in diverse societies. To move ahead, governments must begin to consider how their policies in every sector can promote or impede the health in their populations. And they must engender the political will to make human welfare a high priority.

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Discussion Questions

1. Compare and contrast the conditions affecting infant and child mortality in developed and developing countries. Explain the relationship between family planning and child survival.

2. Outline the health-care experiences (for example, doctor visits, hospitalization, or preventive care) of a person living in a developed country at different stages of life: during infancy and childhood, young adulthood, middle age, and old age. How might this differ from the experience of a person living in China, India, or sub-Saharan Africa?

3. How does a population's age structure affect the demand for health-care services?

4. How might the growing prevalence of AIDS influence the type of medical care available in a society? Use specific countries or regions to examine the impact of AIDS on the mortality and morbidity of the general population.

5. Contrast morbidity patterns in developed and developing countries.

6. List specific factors that have led to gains in life expectancy in developed nations. How do these differ from improvements in life expectancy in developing nations?

7. How does urbanization affect patterns of mortality and morbidity in a society?

8. Discuss the factors that might account for Japan's low mortality rate.

9. What changes are occurring in the U.S. health-care system as the population ages? What changes are ahead for the health-care system in the next century?

10. Give examples of how transportation and access to global information have transformed both the spread and the treatment of disease.

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